

Radar Characterization of the Interplanetary Meteoroid Environment, Phase I

Completed Technology Project (2006 - 2006)



Project Introduction

We propose a new modeling effort that will make substantial refinements and improvements to our existing models of the interplanetary meteoroid environment near Earth. Because of recent theoretical and observational advancements within the field of radar meteors, we believe that existing models for the interplanetary meteor environment that are based upon or validated with radar meteor observations (Such as the NASA Meteoroid Environment Model MEM) lack important theoretical underpinning, and can be improved. Specifically, we now understand that the plasma generated during meteor entry is highly unstable and turbulent, and the evolution of this plasma, is at all stages largely influenced by plasma processes such as wave and ambipolar electric fields. Yet this has not been taken into account in any detailed radar meteor scattering theory. We propose to use our existing and on-going plasma simulations and models to provide the input profiles of conductivity and permittivity for finite difference time domain (FDTD) simulations which can then interrogate the structure using plane waves that replicate radar pulses over the range of used frequencies from HF to L-Band. Using this approach together with our models for how the meteor plasma varies as a function of both meteor parameters such as size, composition, and velocity, and, atmospheric parameters such as winds/electric fields, density, temperature and altitude, will allow us to understand and characterize the full range of radar derivable information from meteors. Achieving these proposed goals will close the existing information gap and resolve the conflicting observations we have on the interplanetary meteor flux. Our results will provide a revised model for the interplanetary meteoroid environment that will strongly support NASA's planned manned and un-manned missions near Earth and to the Moon and Mars.



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Marshall Space Flight Center (MSFC)

Responsible Program:

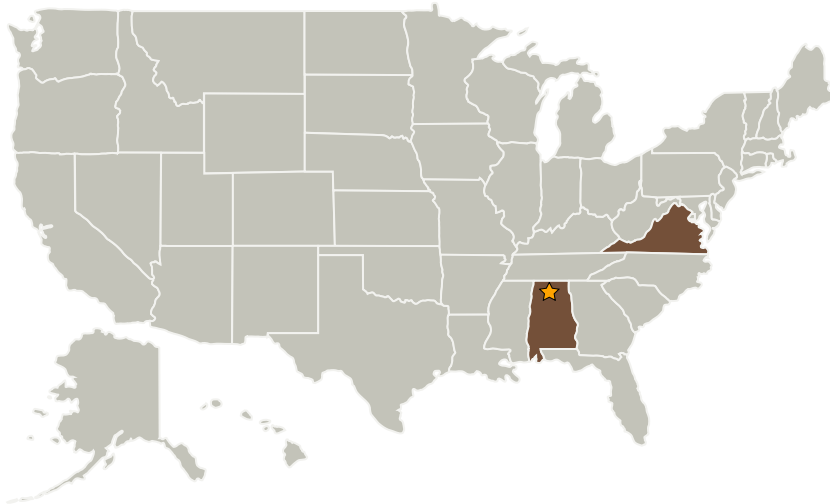
Small Business Innovation Research/Small Business Tech Transfer

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Primary U.S. Work Locations and Key Partners



Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX09 Entry, Descent, and Landing
 - └ TX09.4 Vehicle Systems
 - └ TX09.4.5 Modeling and Simulation for EDL

Organizations Performing Work	Role	Type	Location
★ Marshall Space Flight Center (MSFC)	Lead Organization	NASA Center	Huntsville, Alabama
Center for Remote Sensing Inc	Supporting Organization	Industry	Arlington, Virginia

Primary U.S. Work Locations

Alabama	Virginia
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